

## SEMINAR OULINE FOR THE O.S.

### A. Overview of the O.S.

1. Elements of the O.S.
  - a. ROM-Based Character Set.
  - b. System Data Base
  - c. A set of Vectors to System Routines
  - d. I/O Subsystem Structure
    1. I/O Control Blocks
    2. I/O System Routines
  - e. Interrupt Handlers
    1. Non-Maskable Interrupts (NMI's)
    2. Maskable Interrupts (IRQ's)
  - f. Monitor
  - g. Timers
  - h. I/O Hardware Registers
  - i. Program RAM
  - j. Floating Point Package
  - k. Cartridges

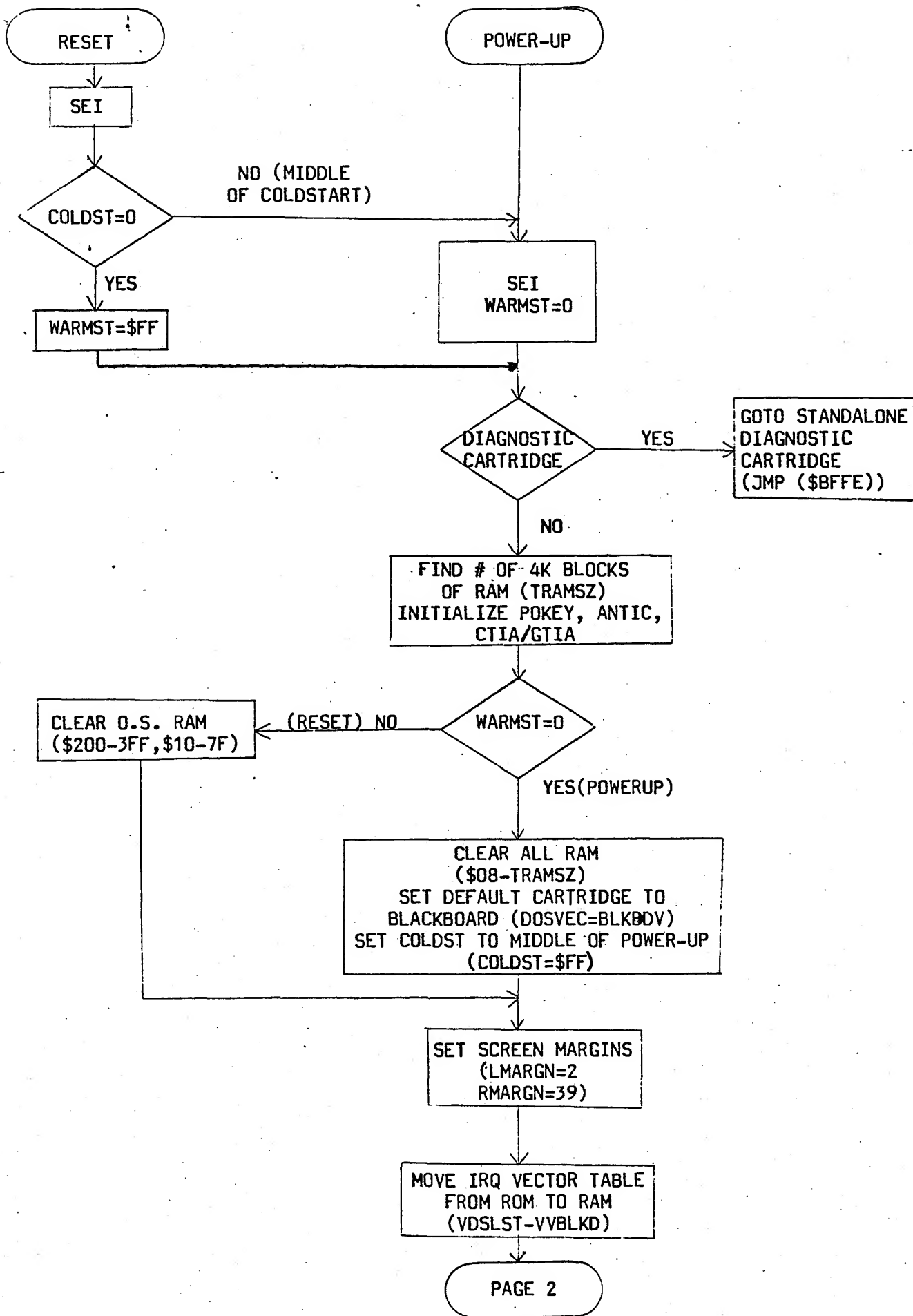
### B. I/O Subsystem Structure

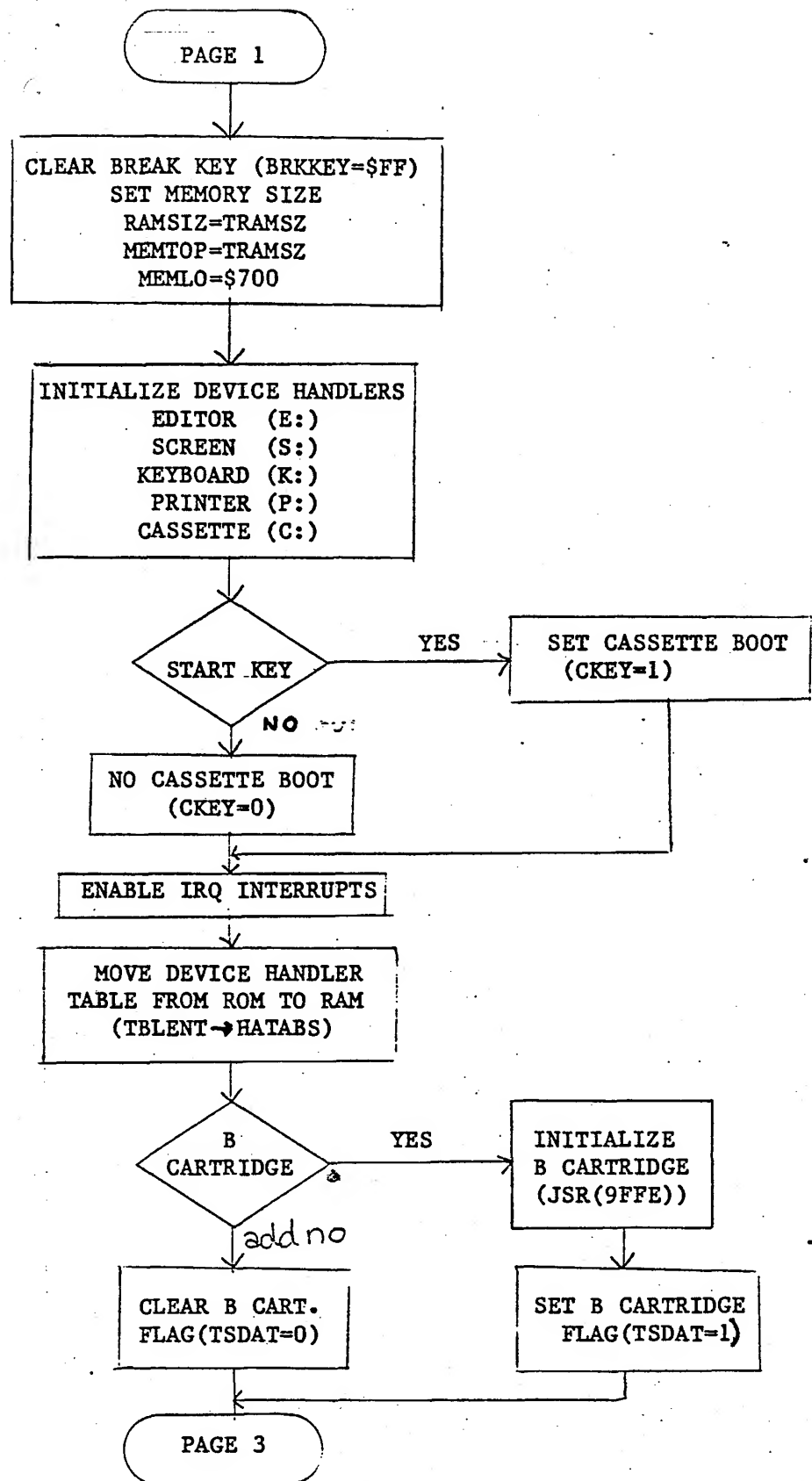
1. I/O Control Blocks
  - a. IOCB's
  - b. ZIOCB
  - c. DCB
2. I/O System Routines
  - a. CIO
    1. Calling Convention
    2. Handler Address Table(HATABS)
    3. Handler Entry Point Tables
  - b. Device Handlers
    1. Resident Handlers
      - a). Display Editor (E:)
      - b). Screen Handler (S:)
      - c). Keyboard (K:)
      - d). Printer (P:)
      - e). Cassette (C:)
    2. Resident Disk Handler
    3. Non-Resident Handlers
      - a). DOS
      - b). RS-232 Handler (850)
      - c). User-added Handlers
  - c. SIO
    1. Calling Convention

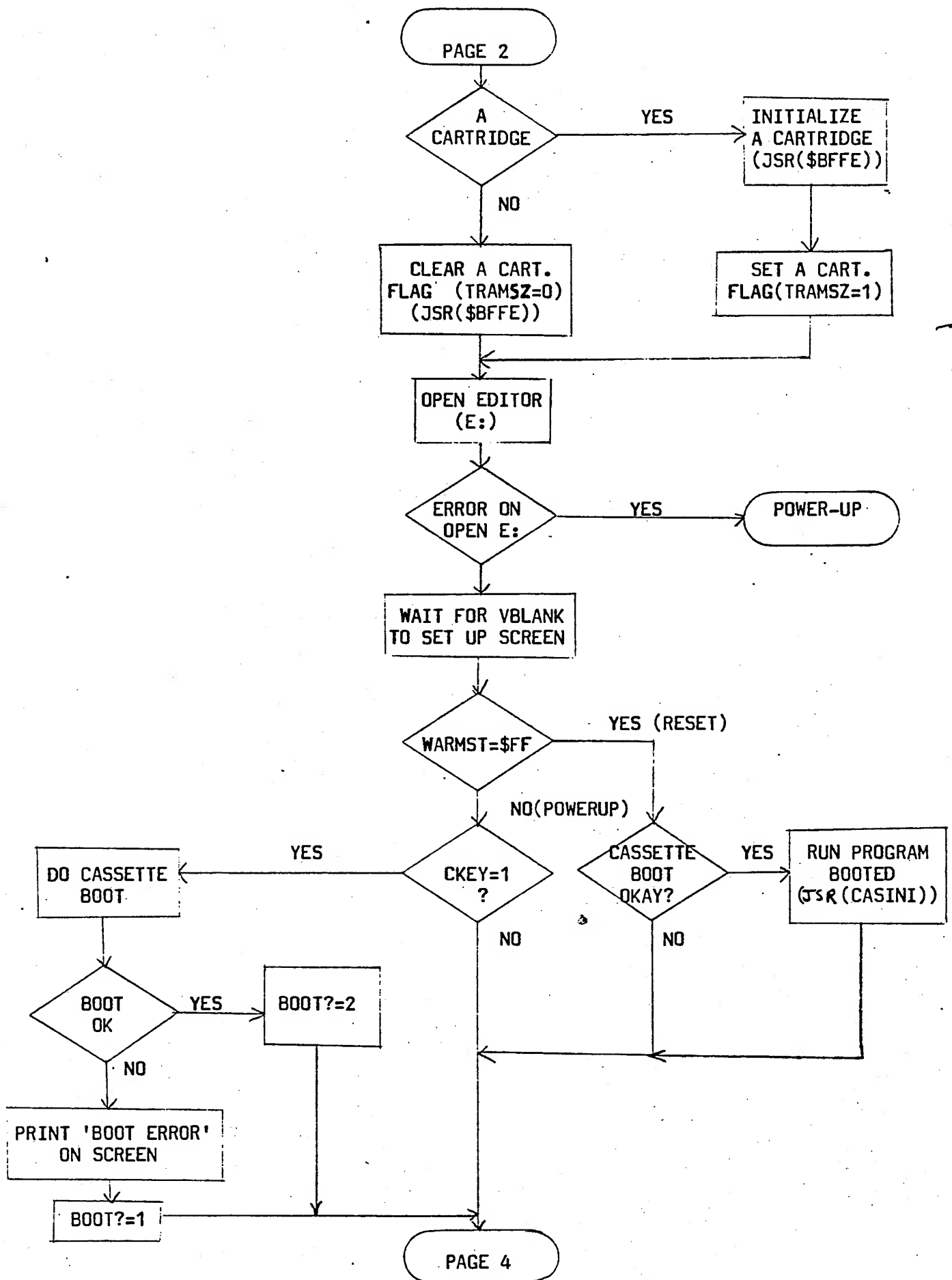
### C. Monitor

1. Called
  - a. Power-up (Coldstart)
    1. Power-cycled
    2. Coldstart Vector (E477)
    3. SYSTEM RESET If COLDST<>0
  - b. SYSTEM RESET (Warmstart)
    1. SYSTEM RESET Key
    2. Warmstart Vector (E474)
2. Points of Interest
  - a. A Warmstart Changes
    1. MEMLO

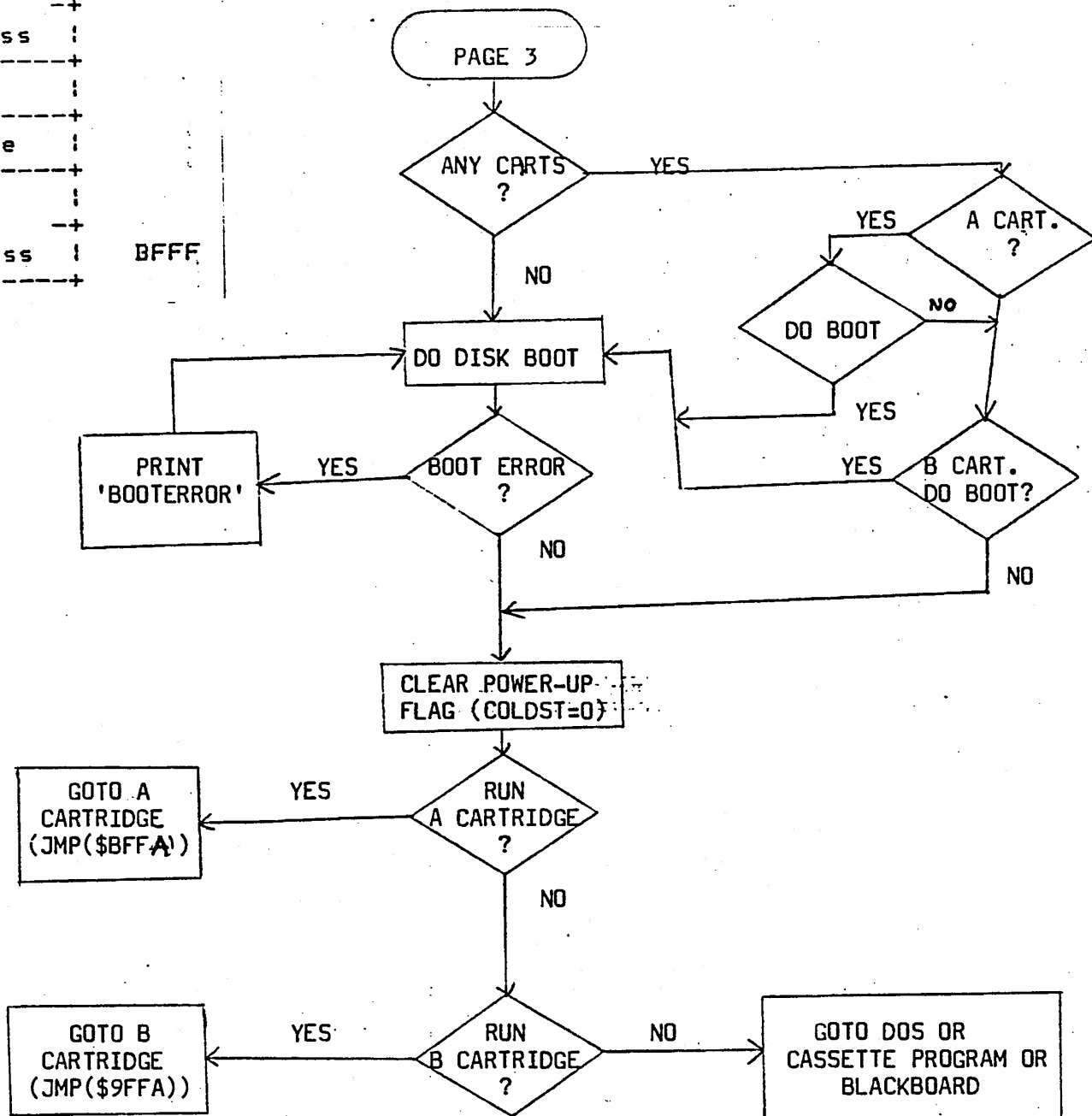
- 2. Handler Address Table (HATAES)
- 3. IRQ Vector Table
- b. JSR (CASINI) if BOOT? set
- c. JSR (DOSINI) if BOOT? set
- e. Using DOSINI to fix a above
- D. Program RAM
  - 1. Memory Map
    - a. MEMLO
    - b. MEMTOP
    - c. APFMHI
    - d. RAMTOP
- E. Interrupt Handlers
  - 1. NMI's
    - a. SYSTEM RESET - Non-Maskable
    - b. DLI
      - 1. VDSLST - Display List Vector
    - c. VBLANK
      - 1. Immediate (Stage 1)
        - a. VVBLKI - Vector
        - b. Critical Sections
          - 1). SEI
          - 2). CRITIC
        - c. Stage 2
          - 1). Shadows
      - 2. Deferred
        - a. VVBLKD - normally points to RTI
  - 2. IRQ's
    - a. One Bit Mask (SEI/CLI)
    - b. IRQEN and FOKMSK
    - c. The IRQ's Vectors and Their uses
      - 1. VMIRQ - system IRQ Vector
      - 2. VBREAK - Software BRK instr.
      - 3. VKEYBD - Key board interrupt
      - 4. VSERIN - Serial Bus Input Ready
      - 5. VSEROR - Serial Bus Output Ready
      - 6. VSEROC - Serial Bus Complete
      - 7. VTIMR1 - Pokey Timer 1
      - 8. VTIMR2 - Pokey Timer 2
      - 9. VTIMR4 - Pokey Timer 4
      - 10. CDTMA1 - System Timer 1
      - 11. CDTMA2 - System Timer
- F. Timers
  - 1. Real Time Clock (RTCLOK)
    - a. 3- byte Frame Counter
  - 2. System Timers
    - a. CDTMV1 - CDTMA1
    - b. CDTMV2 - CDTMA2
    - c. CDTMV3 - CDTMF3
    - d. CDTMV4 - CDTMF4
    - e. CDTMV5 - CDTMA5







cartridge	BFFA
start address	
00	
option byte	
cartridge	
init address	BFFF



The byte of "00" is used to allow the OS to determine when a cartridge is inserted; locations BFFC and 9FFC will not read zero when there is neither RAM at those locations nor a cartridge inserted. RAM is differentiated from a cartridge by its ability to be altered.

The option byte has the following option bits:

Bit-0 = 0, then do not boot the disk.  
1, then boot the disk.

Bit-2 = 0, then init but do not start the cartridge.  
1, then init and start the cartridge.

Bit-7 = 0, then cartridge is not a diagnostic cartridge.  
1, then cartridge is a diagnostic cartridge & control will be given to the cartridge before any of the OS is initialized (JMP (BFFE)).

# IOCB CHART

CALL	ICHI0	ICDNO	ICCOM	ICSTA	ICBAL	ICBAH	ICPTL	ICPTH	ICBL	ICBLH	ICAX1	ICAX2
OPEN FILE + READ	X	X	3	note 1	\$80	06	X	X	X	X	4	0
OPEN FILE - WRITE	X	X	3	note 1	\$80	06	X	X	X	X	8	note 2
GET BYTES	X	X	7	note 1	00	06	X	X	\$80	00	X	X
PUT BYTES	X	X	1B	"	00	06	X	X	\$80	00	X	X
GET RECORD	X	X	5	"	00	06	X	X	\$80	00	X	X
PUT RECORD	X	X	9	"	00	06	X	X	\$80	00	X	X
CLOSE FILE	X	X	\$C	"	X	X	X	X	X	X	X	X
STATUS	X	X	\$D	"	X	X	X	X	X	X	X	X

NOTE 1 - The status of the I/O command is stored here and in the Y REG. on return from CIO

NOTE 2 - The Auxiliary bytes of the IOCB's are used by some handlers to indicate special modes

GENERAL NOTE: THE ABOVE IOCB definitions assume

\* = \$600

IOBUFF  
FILE

.RES  
.BYTE

80

'D:MYPROC.BAS'

< - indicates ignore but do not change the current value

IOCB CHART

# HANDLER ADDRESS TABLE

```

E430 PRINTV = $E430
E440 CASETV = $E440
E400 EDITRV = $E400
E410 SCRENV = $E410
E420 KEYEDV = $E420

```

```

0000 ; *= $031A

```

HATABS

```

031A 50 .BYTE 'P
031B 30E4 .WORD PRINTV
031D 43 .BYTE 'C
031E 40E4 .WORD CASETV
0320 45 .BYTE 'E
0321 00E4 .WORD EDITRV
0323 53 .BYTE 'S
0324 10E4 .WORD SCRENV
0326 4B .BYTE 'K
0327 20E4 .WORD KEYEDV
0329 00 .BYTE 0
032A 0B .BYTE 0,0
032B 00
032C 00 .BYTE 0
032D 00 .BYTE 0,0
032E 00
032F 00 .BYTE 0
0330 00 .BYTE 0,0
0331 00
0332 00 .BYTE 0
0333 00 .BYTE 0,0
0334 00
0335 00 .BYTE 0
0336 00 .BYTE 0,0
0337 00
0338 00 .BYTE 0
0339 00 .BYTE 0,0
033A 00
033B 00 .BYTE 0
033C 00 .BYTE 0,0
033D 00

```

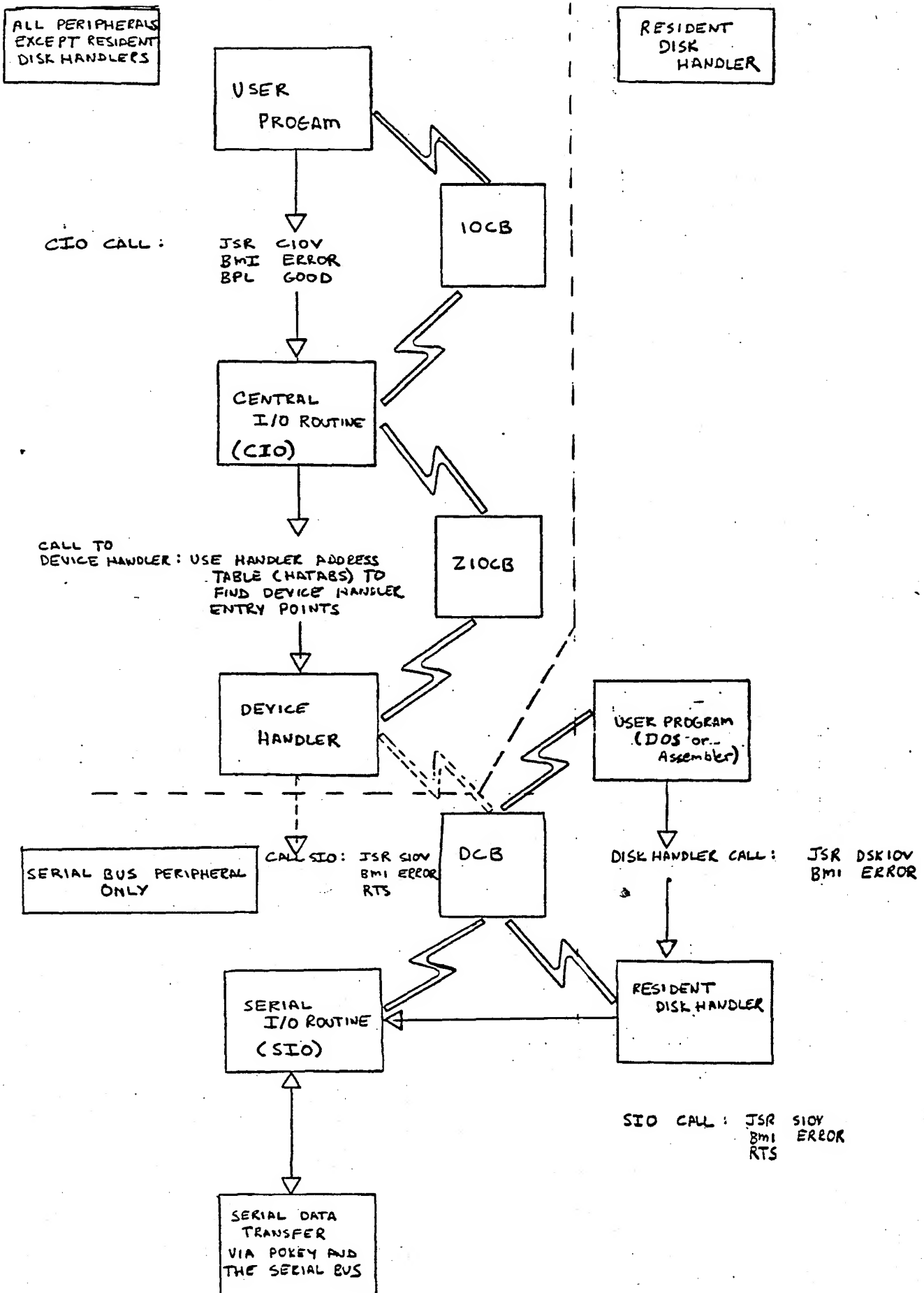
PRINTER HANDLER ENTRY POINTS

==E430

E430	9E EE	WORD	PHOPEN-1	PRINTER HANDLER OPEN
E432	DB EE	WORD	PHCLOS-1	PH CLOSE
E434	9D EE	WORD	9ADST-1	PH READ
E436	A6 EE	WORD	PHWRIT-1	PH WRITE
E438	80 EE	WORD	PHSTAT-1	PH STATUS
E43A	9D EE	WORD	9ADST-1	PH SPECIAL
E43C	4C 7B EE	JMP	PHINIT	PH INIT.
E43F	00	.BYTE	0	ROM FILLER



# I/O Subsystem Structure



```

10 ;WRITTEN BY...MICHAEL EKBERG
20 ;
600 30 START      =    $600
000 40 DOSINI     =    $0C
2E7 50 MEMLO     =    $2E7
000 60 NEWMEM     =    $3000      ALTER THIS TO GET SIZE
70 ;THIS ROUTINE RESERVES SPACE FOR
80 ; ASSEMBLY ROUTINES BY RESETTING
90 ; THE MEMLO POINTER. IT RUNS AS
0100 ; AN AUTORUN.SYS FILE. IT ALSO
0110 ; RESETS MEMLO ON [RESET]. MEMLO
0120 ; IS SET TO THE VALUE OF NEWMEM.
0130 ;
0140 ;THIS PART IS PERMANENT, IE. NEEDS
0150 ; TO BE RESIDENT. THE SYSTEM DOS INIT VECTOR
0160 ; HAS BEEN STOLEN, AND STORED IN
0170 ; THE LOCATION INITDOS+1&2.
0180 ; DOS IS INITIALIZED AND MEMLO IS INITIALIZED
0190 ; INITDOS EXECUTES ON [RESET].
0200      *=    START
0210 INITDOS
0600 200D06 0220      JSR  ENDRTS      ;DO DOS INITLIST
0603 A900 0230      LDA  #NEWMEM & 255
0605 8DE702 0240      STA  MEMLO
0608 A930 0250      LDA  #NEWMEM/256
060A 8DE802 0260      STA  MEMLO+1
0270 ENDRTS
060D 60 0280      RTS
0290 ; THIS PART IS EXECUTED AT POWER
0300 ; UP ONLY AND CAN BE DELETED
0310 ; AFTER POWER-UP.
0320 ; THIS ROUTINE STORES THE
0330 ; CONTENTS OF DOSINI INTO A JSR
0340 ; AT LOCATION INITDOS+1. IT
0350 ; THEN REPLACES DOSINI WITH
0360 ; IT'S OWN VALUE, THE LOCATION
0370 ; INITDOS.
0380 BEGIN
060E A50C 0390      LDA  DOSINI      SAVE DOSINI
0610 8D0106 0400      STA  INITDOS+1
0613 A50D 0410      LDA  DOSINI+1
0615 8D0206 0420      STA  INITDOS+2
0618 A900 0430      LDA  #INITDOS&255 SET DOSINI
061A 850C 0440      STA  DOSINI
061C A906 0450      LDA  #INITDOS/256
061E 850D 0460      STA  DOSINI+1
0620 A900 0470      LDA  #NEWMEM&255 SET MEMLO
0622 8DE702 0480      STA  MEMLO
0625 A930 0490      LDA  #NEWMEM/256
0627 8DE802 0500      STA  MEMLO+1
062A 60 0510      RTS

062B 0520      *=    $2E2
062E 0E06 0530      .WORD BEGIN      SET RUN ADDRESS
062F 0540      .END

```